

Scientists Rethinking Nature of Animal Memory

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An elephant never forgets—or does it?

Scientists have long believed that animals do not have so-called episodic memory—the kind that allows humans to remember past events. But recent experiments with scrub jays, chimpanzees, and gorillas have led to rethinking of the nature of memory in animals.

Animal memory researchers first face the challenge of communicating between species. "You can't exactly ask the animals where they were, and what they were doing, when Bambi's mother was shot," says Nicola Clayton, a professor of comparative cognition at University of Cambridge in England and a leading researcher in the field of animal memory.

Over the past six years Clayton has devised a series of ingenious experiments that seem to show that scrub jays can recall past events and use the information to plan for the future.

"We have traditionally regarded animals like machines, or automata, believing that they just have reflexes and habits," says John Pearce, a professor of psychology at Cardiff University in Wales. "Clayton's work is revolutionary because it challenges these ideas and suggests that animals have richer memories than previously thought."

Clayton chose scrub jays because she was fascinated by their food-caching behavior: They stash food to recover later. The jays adapt their caching habits to the perishability of the item, Clayton discovered. In one experiment, Clayton left out worms and peanuts for the jays to store. The birds preferred to retrieve the worms, unless a long period of time had elapsed. Then the birds went for the peanuts—a preference they presumably "remembered" from finding spoiled worms.

Mental Time Travel

One of Clayton's later experiments with the resourceful jays involved observing how they behaved when stashing food in caches that might be robbed by other birds. Jays with experience of such avian robbery were much more cautious about their stashes.

"It is as if the pilferer recognizes that its food could be stolen in the future and makes sure no one sees his cache," Clayton says. "This is the first time we have seen evidence that an animal other than a human recalled the social context of an event and adjusted its future behavior."

Psychologists say that episodic memory mediates the ability to remember—or to engage in a form of "mental time travel." The question is whether that ability is uniquely human.

"There are many beautiful examples of complex behavior that occur without higher thought or consciousness," cautions Endel Tulving, a cognitive psychologist at the Rotman Research Institute of Baycrest Center for Geriatric Care in Toronto. In his book "Elements of Episodic Memory," Tulving wrote that animals can adjust, adapt, and learn, but they cannot "travel back into the past in their own minds." But he enjoys the fact that scientists are challenging his ideas.

Neither Clayton nor Pearce are completely convinced yet that the jays have episodic memory and can replay past events in their minds like humans do. But the jay experiments have inspired similar studies in

other species.

Bennett Schwartz, a cognitive psychologist at Florida International University in Miami, is studying memory in a western lowland gorilla named King.

Memory in Chimps and Gorillas

King, a 450-pound (205-kilogram) male silverback in his 30s, communicates with caretakers via picture cards. Using the cards, he has shown that he can remember who gave him certain foods—even when his caretakers cannot remember.

Recently Schwartz and his colleagues staged events in front of King using 33 people that the gorilla had never seen before. Different individuals would do jumping jacks or "steal" a phone from King's trainer or play the guitar.

When King was asked to identify the person by activity, he was correct more than 60 percent of the time. "It's a little like targeting one person out of a police lineup," Schwartz says. He is now beginning to teach King the concept of time—yesterday, today, and tomorrow.

For studies at Georgia State University in Atlanta, anthropologist Charles Menzel is working with a female chimpanzee named Panzee, who uses a keyboard with more than 256 lexigrams.

Outside Panzee's enclosure, Menzel and his colleagues hid more than 30 different items, one at a time—kiwis, pineapples, rubber snakes, balloons, and paper—while Panzee was watching.

In more than 90 percent of the cases, Panzee correctly identified which type of item was hidden where, and directed her caretakers—unaware of the hiding places—to find the specified toys and fruits. Menzel points out that Panzee herself initiates the communication—significant because the act of "remembering" is spontaneous.

"Animals are using something related to episodic memory, but not necessarily the same as in humans," Menzel says. "Animal memory systems have always been underestimated—the upper limits are not really known."